Space Weather Forecast

Issued on Sunday, 16 July 2023 at 01:29 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Minor/Moderate R1/R2 Blackouts likely throughout G1-G2/Moderate Likely Storms Day 2 (17 July), and possible Day 3 (18 Jul).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity in the last 24 hours has been Moderate, with several Moderate flares. The largest was observed at 15/0741 UTC from the large region in the southwest quadrant, with a further flare also observed at 15/1010UTC from the other large region in the northeast quadrant. These two regions are the most notable on the disc, both large and relatively stable, but with some magnetic complexity. A further region of note is also in the northeast disc, with ongoing development of small intermediate spots.

A coronal mass ejection (CME) was observed leaving the Sun from the larger moderate flare, however this has been preliminary assessed as likely missing, passing ahead of Earth. A couple of other CMEs were observed well-off the Earth-Sun line.

Solar Wind / Geomagnetic Activity: Solar winds, observed by ACE and DSCOVR at L1, indicated the tail end of a weak CME arrival followed by slightly elevated winds from a weak coronal hole. The speed declined from 400km/s to 350 km/s, before jumping back to 400-450km/s after 15/1010 UTC. The total magnetic field, was initially moderate but gradually eased to be weak 17/1250 UTC. The north-south component was largely weak and initially northward directed, except between 15/0840-1020UTC when it became southward directed, and becoming weak and variable by the end of the period. Geomagnetic activity was Quiet Unsettled (Kp1-3).

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) was initially at background, however a very slight rise occurred at 15/1200 UTC, followed by a larger rise just before 2100 UTC. However the flux remained well below the S1 Minor Radiation storm threshold.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate activity is likely, with a slight chance of Strong flares. These are most likely from the two largest regions on the disc.

Solar Wind / Geomagnetic Activity: Earth is likely to see a CME arrive on day 2 (17 Jul) from the combined common-class flare and filament eruption that occurred on the 14 Jul. The strength of any impact is low confidence, due to uncertainties about the amount of any material in the CME, along with limited imagery for analysis, however this is currently expected to arrive 17/1400 +/- 10 hours. Otherwise solar winds are likely to ease towards background day 1 (16 Jul), and again once any CME influence subsides later day 3 (18 Jul). There is a slight chance of a small enhancement from the arrival of fast winds from a coronal hole later day 4 (19 Jul). Mainly Quiet geomagnetic activity is expected to become Active to G2 Moderate storm during the second half of day 2 (17 Jul). These conditions gradually easing day 3 (18 Jul) to be mainly Quiet by day 4 (18 Jul), however there is a slight chance of activity rising again to Unsettled to Active.

Energetic Particles / Solar Radiation: No solar radiation storms are expected, but there is a

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slight chance of reaching the S1/Minor Storm threshold through the period, should any larger X-ray flares occur. An increase in observed count rates may also occur just ahead of the CME arrival expected on day 2 (17 Jul)

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	60	40	5
Strong	G3	No	1	20	10	1
Severe	G4	No	1	2	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	70	70	60	60
Very Active	R3 to R5 X	No	10	10	10	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	15	20	10	10
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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